WHAT IS CLAIMED IS:

1. A method for forming a silicon epitaxial layer comprising the steps of:

cleaning the surface of a silicon substrate having dopant of predetermined concentration doped therein with mixed plasma comprising an etching gas containing fluorine and hydrogen or deuterium; and

forming a silicon epitaxial layer on the cleaned surface of the silicon substrate.

2. The method as set forth in claim 1, wherein the doped concentration of the silicon substrate is 10^{18} to 10^{21} atoms/cm^3.

3. The method as set forth in claim 1, wherein the cleaning step is carried out under a pressure of 1 mTorr to 1 Torr.

4. The method as set forth in claim 1, wherein the etching gas containing fluorine is SF6.

5. The method as set forth in claim 4, wherein the ratio of the flow rate of SF6 to hydrogen is 1/10 to 1/1000.

6. The method as set forth in claim 1, wherein the cleaning step and the silicon epitaxial layer-forming step are carried out in the same chamber.

7. The method as set forth in claim 1, wherein the cleaning step and the silicon epitaxial layer-forming step are carried out separately in different chambers, and wherein the silicon substrate is not exposed to the air when the silicon substrate is transferred to form the epitaxial layer after the surface of a silicon substrate is cleaned with the plasma.

8. The method as set forth in claim 1, wherein the mixed plasma is remote plasma.

9. The method as set forth in claim 1, wherein the silicon epitaxial layer-forming step is carried out at a temperature of 550 to 700 ℃.